The Impact of Social Awareness, Empathy, and Confidence on Blindness to Change in Facial Emotions

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Background

Change blindness is a phenomenon occurring when an individual is unable to detect changes in a visual stimulus. Previous studies have measured an observer's ability to detect changes in images separated by some sort of disruption, for example a gorilla walking among basketball players on a court while a game is in play (Simons & Chambris, 1999). It seems impossible to believe that observers would not notice the gorilla. However, since their attention is directed to following the ball on the basketball court instead of the players, the majority of observers report no awareness of the presence of the gorilla.

The present study investigates change blindness, specifically variations in facial indications of emotion. Previous studies have shown that gradual changes of facial emotion produce substantive levels of change blindness when observers are instructed to report the changes verbally (David et al., 2006). However, measures of ocular gaze (i.e., visual scan paths, fixation times, and pupil dilations) assessed by eye-tracking equipment, reveal that more attention is focused on features of a face that are thought to be more indicative of a change in emotion (i.e., eyes) than on static non-facial stimuli (Davies & Hoffman, 2003). It has also been noted that observers express high levels of confidence in their ability and accuracy to detect a change in a stimulus if it were to take place even though they consistently fail to detect changes (Blackmore et al., 1995).

Other research (e.g., Busch, 2010) has shown that physiological measures reveal that more attention is focused on features of a face that are thought to be more indicative of a change in emotion (i.e., eyes) than on non-facial stimuli (Davies & Hoffman, 2003). Consequently, we used eye-tracking equipment, such as the headband and its cameras, to measure visual scan paths, gaze fixation times, and pupil dilations to detect whether this type of physiological information is consistent with subjective responses

Hypothesis

First, we hypothesize that gradual changes in the facial emotion of an actor in a video will attract more gaze and fixation time, as measured by an eye-tracker, and be detected more frequently than gradual changes in a neutral stimulus (e.g., changing the color of a shirt). Second, changes in facial emotion will be detected more often by observers who have greater social awareness and empathy. Third, observers who are unable to detect changes in facial emotions will express, *a priori,* more overconfidence in their ability to do so compared to observers who are able to detect changes in facial emotions.

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Method

Participants will be informed that they should attend to changes that will occur in each of a series of eight, 12-second videos presented on a computer monitor. The videos were originally developed by David et al. (2006); each video is comprised of a series of frames that indicate gradual changes in either facial expressions of the actors (e.g., from happy to neutral; see Figure 1) or in non-facial stimuli (e.g., from dark to light blue in the color of a shirt; see Figure 2) in the video. Presentation order of the four videos will be randomized. Half of the facial changes represents positive emotional expressions (i.e., happy), and the other half represents negative emotional expressions (i.e., sad); half of the participants will see videos that begin with the neutral expression, and the other half will see videos that begin with the emotional expression.

After each video presentation, participants will complete a questionnaire developed by the researchers for this study to assess whether they observed any change in events or objects in the video. The *About your Experience Questionnaire 1* also asks participants to identify the nature of any observed change, and how confident they are that they have noticed a change.

Following the presentation of all four videos, participants will complete a modified version of the Social Awareness Inventory (SAI; Sheldon, 1996; see Figure 3), the Questionnaire of Cognitive and Affective Empathy Scale (QCAE; Reniers et al., 2011; see Figure 4), and the *About your Experience 2 Questionnaire (*AEQ2; developed by the researchers for this experiment). The AEQ2 is a set of questions designed by the researchers for this study to assess manipulation awareness, change blindness, attention to change in facially-expressed emotions, and confidence in the assessment of the facial expression change.

Figure 1. Example of Expression Change

Figure 2. Example of Color Change

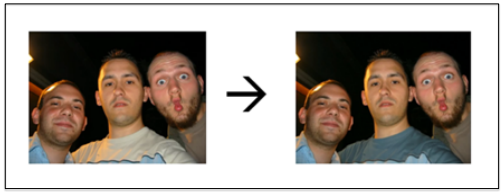

Figure 3. Example question from SAI

1	2	3	4
Not at all			Very much
1. I often try to come up with my own explanation for why people feel or think a certain way, rather than accepting theirs.			1 2 3 4

Figure 4. Example question from QCAE

People differ in the way they feel in different situations. Below you are presented with a number of characteristics that may or may not apply to you. Read each characteristic and indicate how much you agree or disagree with the item by ticking the appropriate box. Answer quickly and honestly.		Strongly agree	Slightly agree	Slightly disagree	Strongly disagree
1.	I sometimes find it difficult to see things from the 'other guy's' point of view.				

Results

In a pilot study of the procedure without the eye-tracking apparatus, we tested 6 participants. A preliminary look at the data included the following analyses. First, we evaluated the difference between mean detected change in videos depicting facial emotions (see Table 1) as compared with those videos depicting neutral objects (e.g., color of a shirt). There was no significant difference in mean change detection as evaluated by an independent measures t-test. However, single group t-tests of the difference between observed and expected change detection (expected value = 4 of the 8 videos, or 50% accuracy, if guessing) indicated that change detection both of emotions and neutral objects was significantly less than expected, but similar to traditional results.

Table 1. Mean Responses for each Participant Measure

Participant Measure	Mean	Standard Deviation
Change detection: emotions	2.67	0.52
Change detection: neutral objects	2.00	1.10
Social Awareness Inventory (SAI)	48.67	4.18
Questionnaire of Cognitive and Affective Empathy Scale (QCAE)	82.00	6.93

Further analysis compared accuracy of change detection with details of what was observed in the videos that supported or not the responses of the participants. The amount of detail supporting change detection was strongly related to change detection, itself, when the change was in a neutral object, but while high, was not reliable when the change was in facial emotion. In regards to the SAI and QCAE, our correlation analysis was unable to produce meaningful results due to lack of participants at this time.

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